

2 Bipolar Analog/Digital and 8 Universal Signal Inputs Controller

CAN (SAE J1939), Ethernet
Two +5V references
DIN rail mount

P/N: AX032100

Features:

- SAE J1939 CAN port with auto-baud-rate detection
- Ethernet port (Modbus TCP/IP)
- Two (2) signal inputs are selectable as bipolar voltage, current, digital or PWM signal types:
 - 0-5V, 0-10V, 0 to +/- 5V, 0 to +/- 10V;
 - 4-20mA, 0-20mA;
 - PWM, Frequency;
 - or Digital (Discrete Voltage Level).
- Eight (8) universal signal inputs are selectable as bipolar voltage, current, resistive, digital, PWM or frequency signal types:
 - 0-5V, 0-10V;
 - 4-20mA, 0-20mA;
 - Resistive
 - PWM;
 - Frequency;
 - or Digital.
- 12Vdc or 24Vdc nominal
- Two reference voltages (+5V) are available.
- Operates from -40 to 85°C (-40 to 185°F).
- Two LED indicators
- IP20
- DIN rail mount, screw terminal connections
- Configurable via Electronic Assistant



Applications:

- industrial control panels
- power gen set engine control systems
- oil and gas equipment automation
- machine automation

Ordering Part Numbers:

2 Bipolar A/D and 8 Universal Signal Inputs Controller, SAE J1939, auto-baud-rate detection:

AX032100

2 Bipolar A/D and 8 Universal Signal Inputs Controller, CANopen®: **AX032101**

Accessories:

Electronic Assistant: **AX070502**

Description: The Controller accepts two analog/digital signal inputs and eight universal signal inputs. The control can be networked to a SAE J1939 or a Modbus TCP/IP fieldbus. Two +5V, 100 mA references are available to power sensor inputs. A rugged power supply interface accepts 12 Vdc or 24 Vdc nominal for battery powered machine applications. LED's indicate operational status. The enclosure is DIN rail mount. It operates from -40 to 85°C (-40 to 185°F). Standard embedded software is provided and is configurable using the Electronic Assistant (EA). The sophisticated control algorithms allow the user to program the controller for a wide range of applications without the need for custom software.

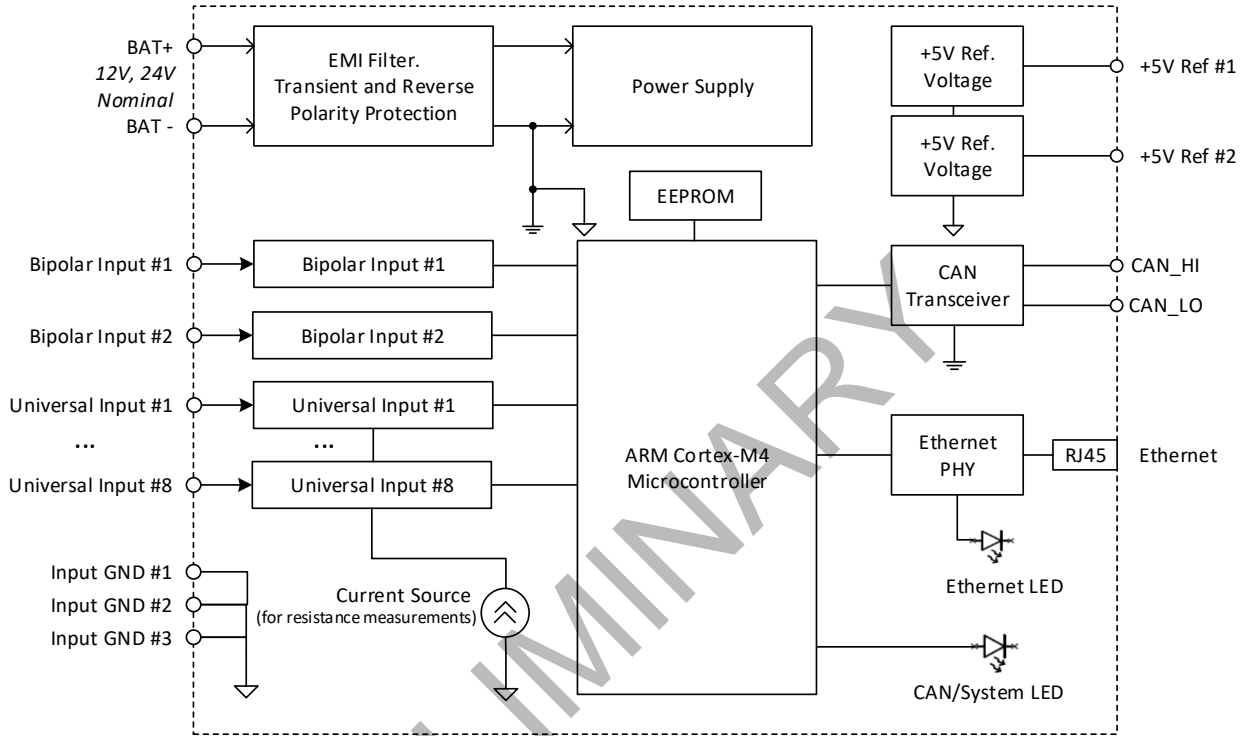


Figure 1.0 – Block Diagram

Technical Specifications:

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Approvals/Limitations and Return Materials Process as described on www.axiomatic.com/service.html.

Power Supply

Power Supply Input	12 Vdc or 24 Vdc nominal 8...36 Vdc power supply range
Protections	Reverse polarity protection Transient protection Short circuit to Ground protection

Bipolar Inputs

Inputs	2 Bipolar Analog or Digital Signal Inputs User programmable as Bipolar or Unipolar Voltage, Current, PWM or Digital signal inputs types. Refer to Table 1.0.																									
Input Grounds	1 provided																									
Protection	All inputs are protected against short to GND. All inputs, except current inputs, are protected against shorts to Nominal Vps (36Vdc).																									
Table 1.0 –User Programmable Bipolar and Analog Inputs																										
Analog Input Functions	Voltage Input, Current Input																									
Voltage Input	0-5 V (Impedance 1M Ω) 0-10 V (Impedance 1M Ω) +/- 5V (Impedance 1M Ω) +/- 10V (Impedance 1M Ω)																									
Current Input	0-20 mA (Impedance 124 Ω) 4-20 mA (Impedance 124 Ω)																									
Analog Update Rate	1.67 ms depending on analog filter settings																									
Input Accuracy and Resolution	<table border="1"> <thead> <tr> <th>Input Type</th> <th>Input Range</th> <th>Accuracy</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Voltage</td> <td>0-5V</td> <td>+/- TBD%</td> <td><1.5 mV</td> </tr> <tr> <td>0-10V</td> <td>+/- TBD%</td> <td><3 mV</td> </tr> <tr> <td>-5V to 5V</td> <td>+/- TBD%</td> <td><3 mV</td> </tr> <tr> <td rowspan="2">Current</td> <td>-10V to 10V</td> <td>+/- TBD%</td> <td><6 mV</td> </tr> <tr> <td>0(4)-20mA</td> <td>+/- TBD%</td> <td><12 μA</td> </tr> </tbody> </table>					Input Type	Input Range	Accuracy	Resolution	Voltage	0-5V	+/- TBD%	<1.5 mV	0-10V	+/- TBD%	<3 mV	-5V to 5V	+/- TBD%	<3 mV	Current	-10V to 10V	+/- TBD%	<6 mV	0(4)-20mA	+/- TBD%	<12 μ A
Input Type	Input Range	Accuracy	Resolution																							
Voltage	0-5V	+/- TBD%	<1.5 mV																							
	0-10V	+/- TBD%	<3 mV																							
	-5V to 5V	+/- TBD%	<3 mV																							
Current	-10V to 10V	+/- TBD%	<6 mV																							
	0(4)-20mA	+/- TBD%	<12 μ A																							
Digital Input Functions	Discrete Voltage Level, PWM Duty Cycle Input, Frequency Input																									
Input Polarity	Active High or Active Low																									
Input Impedance	1 M Ω Impedance – High Z, 10 kOhm pull-down, 10 kOhm pull-up to +14V																									
Input Level	5V CMOS compatible A direct connection to the power supply is acceptable.																									
Discrete Voltage Level Input	1 ms sampling rate Configurable debouncing																									
Frequency Input	Input Number	Counter Resolution	Frequency Range	Resolution	Accuracy																					
	Bipolar Input #1	32-bit	1Hz...10kHz	<0.000012... 0.012%	<0.01%																					
	Bipolar Input #2	16-bit	100Hz...10kHz	<0.0017... 0.17%																						
			10Hz...1kHz																							
			1Hz...100Hz																							
PWM Input	Input Number	Counter Resolution	Frequency Range	Resolution	Accuracy																					
	Bipolar Input #1	32-bit	1Hz...10kHz	<0.000012... 0.012%	TBD																					
	Bipolar Input #2	16-bit	100Hz...10kHz	<0.0017... 0.17%																						
			10Hz...1kHz																							
			1Hz...100Hz																							
PWM Duty Cycle	0...100% Duty Cycle																									
Protection	+/- 36V maximum Forward and reverse polarity protection																									

Universal Inputs

Inputs	8 Universal Signal Inputs User programmable as Voltage, Current, Resistive, Frequency, PWM or Digital signal inputs types. Refer to Table 2.0.																						
Table 2.0 –User Programmable Universal Inputs																							
Analog Input Functions	Voltage Input, Current Input, Resistive Input																						
Voltage Input	0-5 V (Impedance 1M Ω (High Z)) 0-10 V (Impedance 204 k Ω)																						
Current Input	0-20 mA (Impedance 249 Ω) 4-20 mA (Impedance 249 Ω)																						
Input Accuracy and Resolution	<table border="1"> <thead> <tr> <th>Input Type</th> <th>Input Range</th> <th>Accuracy</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Voltage</td> <td>0-5V</td> <td>+/- TBD%</td> <td><1.5 mV</td> </tr> <tr> <td>0-10V</td> <td>+/- TBD%</td> <td><3 mV</td> </tr> <tr> <td>Current</td> <td>0(4)-20mA</td> <td>+/- TBD%</td> <td><12 μA</td> </tr> </tbody> </table>					Input Type	Input Range	Accuracy	Resolution	Voltage	0-5V	+/- TBD%	<1.5 mV	0-10V	+/- TBD%	<3 mV	Current	0(4)-20mA	+/- TBD%	<12 μ A			
Input Type	Input Range	Accuracy	Resolution																				
Voltage	0-5V	+/- TBD%	<1.5 mV																				
	0-10V	+/- TBD%	<3 mV																				
Current	0(4)-20mA	+/- TBD%	<12 μ A																				
Resistive Input	<table border="1"> <thead> <tr> <th>Input Range</th> <th>Resolution</th> <th>Accuracy</th> </tr> </thead> <tbody> <tr> <td>Auto Range 10...250kOhm^{1,2}</td> <td>–</td> <td>–</td> </tr> <tr> <td>0...250Ohm²</td> <td><0.15 Ohm</td> <td>TBD</td> </tr> <tr> <td>0...2.5kOhm</td> <td><1.5 Ohm</td> <td>TBD</td> </tr> <tr> <td>0...25kOhm</td> <td><15 Ohm</td> <td>TBD</td> </tr> <tr> <td>0...250kOhm</td> <td><150 Ohm</td> <td>TBD</td> </tr> </tbody> </table> <p>¹ Resolution and accuracy depend on the automatically selected Input Range. ² Resistance <10 Ohm is measured as 0.</p>					Input Range	Resolution	Accuracy	Auto Range 10...250kOhm ^{1,2}	–	–	0...250Ohm ²	<0.15 Ohm	TBD	0...2.5kOhm	<1.5 Ohm	TBD	0...25kOhm	<15 Ohm	TBD	0...250kOhm	<150 Ohm	TBD
Input Range	Resolution	Accuracy																					
Auto Range 10...250kOhm ^{1,2}	–	–																					
0...250Ohm ²	<0.15 Ohm	TBD																					
0...2.5kOhm	<1.5 Ohm	TBD																					
0...25kOhm	<15 Ohm	TBD																					
0...250kOhm	<150 Ohm	TBD																					
Analog Update Rate	1.67 ms depending on analog filter settings In resistive mode, it also depends on the number of resistive inputs.																						
Digital Input Functions	Discrete Voltage Level, PWM Duty Cycle Input, Frequency Input																						
Input Polarity	Active High or Active Low																						
Input Impedance	1 M Ω Impedance – High Z, 10 kOhm pull-down, 10 kOhm pull-up to +14V																						
Input Level	5V CMOS compatible A direct connection to the power supply is acceptable.																						
Discrete Voltage Level Input	1 ms sampling rate Configurable debouncing																						
Frequency Input	<table border="1"> <thead> <tr> <th>Input Number</th> <th>Counter Resolution</th> <th>Frequency Range</th> <th>Resolution</th> <th>Accuracy</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Universal Input #1-8</td> <td rowspan="3">16-bit</td> <td>100Hz...10kHz</td> <td rowspan="3"><0.0017... 0.17%</td> <td rowspan="3"><0.01%</td> </tr> <tr> <td>10Hz...1kHz</td> </tr> <tr> <td>1Hz...100Hz</td> </tr> </tbody> </table>					Input Number	Counter Resolution	Frequency Range	Resolution	Accuracy	Universal Input #1-8	16-bit	100Hz...10kHz	<0.0017... 0.17%	<0.01%	10Hz...1kHz	1Hz...100Hz						
Input Number	Counter Resolution	Frequency Range	Resolution	Accuracy																			
Universal Input #1-8	16-bit	100Hz...10kHz	<0.0017... 0.17%	<0.01%																			
		10Hz...1kHz																					
		1Hz...100Hz																					
PWM Input	<table border="1"> <thead> <tr> <th>Input Number</th> <th>Counter Resolution</th> <th>Frequency Range</th> <th>Resolution</th> <th>Accuracy</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Universal Input #1-8</td> <td rowspan="3">16-bit</td> <td>100Hz...10kHz</td> <td rowspan="3"><0.0017... 0.17%</td> <td rowspan="3">TBD</td> </tr> <tr> <td>10Hz...1kHz</td> </tr> <tr> <td>1Hz...100Hz</td> </tr> </tbody> </table>					Input Number	Counter Resolution	Frequency Range	Resolution	Accuracy	Universal Input #1-8	16-bit	100Hz...10kHz	<0.0017... 0.17%	TBD	10Hz...1kHz	1Hz...100Hz						
Input Number	Counter Resolution	Frequency Range	Resolution	Accuracy																			
Universal Input #1-8	16-bit	100Hz...10kHz	<0.0017... 0.17%	TBD																			
		10Hz...1kHz																					
		1Hz...100Hz																					
PWM Duty Cycle	0...100% Duty Cycle																						
Protection	+/- 36V maximum Forward and reverse polarity protection																						

Outputs

Voltage References	Two +5V, +/- 1%, 100 mA Short circuit protection Connection to the power supply is prohibited.
--------------------	--

General Specifications

Microprocessor	STM32F407Z, 32-bit, 1MByte flash memory								
Typical Quiescent Current	100 mA@ 12Vdc; 50 mA @ 24Vdc typical								
LED Indicators	2 bicolour LED's Red/Green: CAN/System error/CAN link (activity) Flashing: Bootloader mode Yellow/Green: Ethernet speed/link (activity)								
CAN Communications	1 CAN port (SAE J1939) (CANopen® on request) Full support for SAE J1939 ECU User-configurable PGN's Baud rate: 250, 500, 667 kbit/s, 1 Mbit/s. Automatic baud rate detection.								
Ethernet	One 10 BASE-T/100 BASE-TX Ethernet port Auto-MDIX Ethernet IEEE 802.3, IP, ICMP, ARP, UDP, TCP, Modbus TCP, Proprietary Discovery Protocol								
Modbus TCP/IP	Uses Ethernet port Server mode (slave device) Up to 8 simultaneous connections <table border="1" data-bbox="548 737 1279 842"> <tr> <td colspan="2">Supported function codes:</td> </tr> <tr> <td>2, 4</td> <td>Reading bipolar/Universal inputs</td> </tr> <tr> <td>3, 6, 13, 23</td> <td>Reading/changing configuration parameters</td> </tr> <tr> <td>43/14</td> <td>Reading controller ID, S/N on a private object 0x80</td> </tr> </table>	Supported function codes:		2, 4	Reading bipolar/Universal inputs	3, 6, 13, 23	Reading/changing configuration parameters	43/14	Reading controller ID, S/N on a private object 0x80
Supported function codes:									
2, 4	Reading bipolar/Universal inputs								
3, 6, 13, 23	Reading/changing configuration parameters								
43/14	Reading controller ID, S/N on a private object 0x80								
Control Logic	Refer to the user manual.								
User Interface	To configure the controller for sophisticated control applications, the AX032100 setpoints can be viewed and programmed using the standard J1939 memory access protocol through the CAN port and the PC-based Axiomatic Electronic Assistant. The EA can store all setpoints in one setpoint file and then flash them into the unit in one operation. The setpoint file is created and stored on disk using a command <i>Save Setpoint File</i> from the EA menu or toolbar. The user then can open the setpoint file, view or print it and flash the setpoint file into the unit. The Electronic Assistant, P/N: AX070502 , for <i>Windows</i> operating systems comes with a royalty-free license for use on multiple computers. It includes an Axiomatic USB-CAN converter to link the device's CAN port to a <i>Windows</i> -based PC. Refer to the user manual for details. Modbus TCP - Third-party software								
Software Reflashing	Via J1939 CAN - Electronic Assistant P/N: AX070502 Modbus TCP – not currently supported								
Operating Conditions	-40 to 85 °C (-40 to 185 °F)								
Storage Temperature	-55 to 125 °C (-67 to 257°F)								
Protection	IP20								
Weight	0.30 lb. (0.136 kg)								
Enclosure and Dimensions	Phoenix Contact: ME MAX 22,5 G 2-2 KMGY – 2713638 Polyamide, UL94V0, cULus recognized, China RoHS DIN rail TH 35-7.5 114.5 x 22.5 x 99 x 107 mm 4.508 x 0.89 x 3.898 x 4.213 in (L x H x W x D) Refer to Figure 2.0.								
Electrical Connections	4 sets of 5 Phoenix Contact MC 1,5/ 5-ST-3,5 GY7035 3.5 mm screw terminal connectors Accepts 28-16 AWG wire. RJ-45 for Ethernet connection Refer to Table 3.0 and Figure 2.0. for pin out.								
Installation	DIN rail mount TH 35-7.5 or TH 35-15 (mm)								
Network Termination	ISO 11898 It is necessary to terminate the network with external termination resistors. The resistors are 120 Ohm, 0.25W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network. Baud rate up to 1 Mbit/s is supported.								

PRELIMINARY

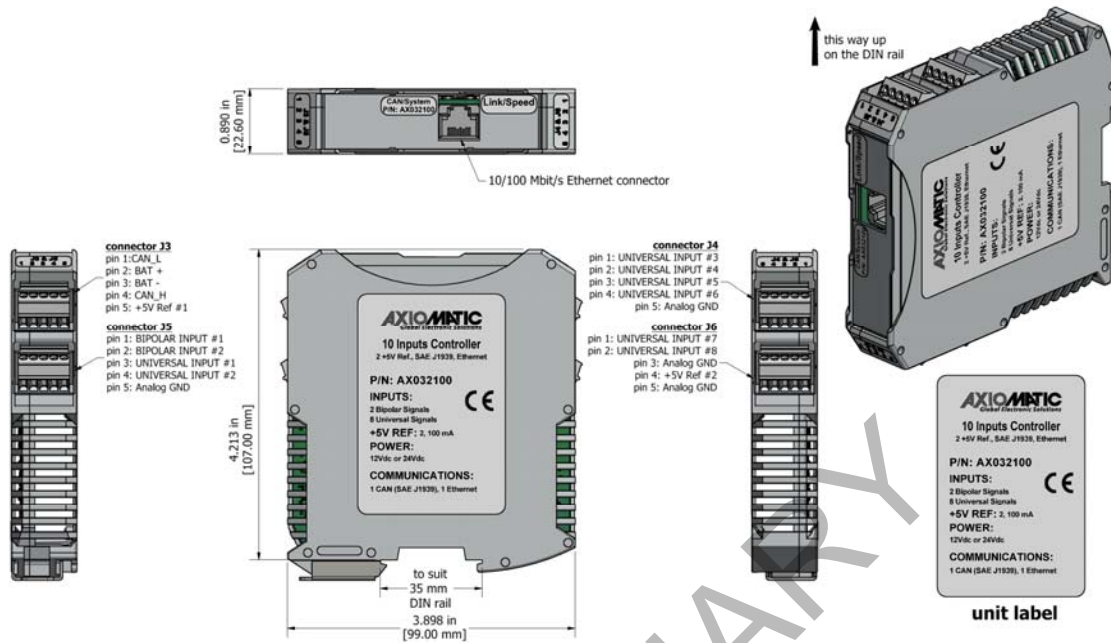


Figure 2.0 – Dimensions

Table 3.0 – Pin out: AX032100

Power and CAN (J3)		Bipolar Inputs 1-2, Universal Inputs 1-2 (J5)		Universal Inputs 3-6 (J4)		Universal Inputs 7-8 (J6)	
PIN #	Function	PIN #	Function	PIN #	Function	PIN #	Function
1	CAN_L	1	Bipolar Analog/Signal Input 1	1	Universal Input 3	1	Universal Input 7
2	BATT +	2	Bipolar Analog/Signal Input 2	2	Universal Input 4	2	Universal Input 8
3	BATT -	3	Universal Input 1	3	Universal Input 5	3	Input GND
4	CAN_H	4	Universal Input 2	4	Universal Input 6	4	+5V Reference 2
5	+5V Reference 1		Input GND	5	Input GND	5	Input GND

Notes:

CANopen® is a registered community trademark of CAN in Automation e.V.

Form: TDAX032100-06/29/20